

REMARKS

Applicant respectfully requests reconsideration of the present application in view of the foregoing amendments and in view of the reasons that follow.

Claims 1 and 2 are currently being amended. The amendment to at least claim 2 is formal in nature and does not change its scope.

This amendment changes claims in this application. A detailed listing of all claims that are, or were, in the application, irrespective of whether the claim(s) remain under examination in the application, is presented, with an appropriate defined status identifier.

After amending the claims as set forth above, claims 1-7 remain pending in this application.

Applicant respectfully requests reconsideration of the present application in view of the above amendments and the reasons which follow.

Allowable subject matter

Applicant appreciates the indication that claim 4 contains allowable subject matter. Applicant has not amended claim 4 to be in independent form, however, because claim 1, from which claim 4 depends, is allowable.

Rejection under 35 U.S.C. § 103

Claims 1, 3 and 5-6 stand rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,482,726 to Aminpur et al. (hereafter "Aminpur") in view of U.S. Patent No. 5,328,810 to Lowrey (hereafter "Lowrey"). Claim 2 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Aminpur and Lowrey in view of U.S. Patent No. 6,124,212 to Fan et al. (hereafter "Fan"). Applicant respectfully traverses these rejections for at least the following reasons.

Independent claim 1 is directed to a method of forming a fine pattern. Claim 1 has been amended to clarify that in the second etching step the etching rate of an exposed area of the first film in the vicinity of the side of the resist pattern is higher than the etching rate of

other exposed areas of the first film. None of the references cited in the rejections suggest this feature of claim 1 in the context of that claim.

Aminpur discloses trimming of resist in a process to ultimately form gate structure 800. As an initial matter, applicants would like to clarify that Aminpur discloses the symbols δ_{TRIM} and Δ to be critical dimensions (see col. 6, lines 56-61), not a pitch as suggested by the Office Action. Aminpur discloses trimming a patterned photoresist 560 to form a trimmed photoresist mask 570 (Figure 5, col. 6, lines 1-8), and using the trimmed photoresist mask 570 to form a patterned hard mask 650 from a hard mask layer 550 using anisotropic etching (Figure 6, col. 6, lines 22-28).

In contrast to claim 1, however, Aminpur does not disclose a second etching step where the etching rate of an exposed area of a first film in the vicinity of the side of a resist pattern is higher than the etching rate of other exposed areas of the first film. The Office Action equates the hard mask layer 550 of Aminpur with the second layer of claim 1, and the second etching step with the disclosure in col. 6, lines 21-40, which describes Figure 6 of Aminpur. In the etch of hard mask layer 550 of Aminpur as shown in Figure 6, however, Aminpur does not disclose that any of the exposed areas of layer 550 have different etch rates, much less that those exposed areas in the vicinity of the side of the trimmed photoresist mask 570 have a different etch rate than other exposed areas. Thus, Aminpur fails to disclose at least a second etching step where the etching rate of an exposed area of a first film in the vicinity of the side of a resist pattern is higher than the etching rate of other exposed areas of the first film.

Aminpur also fails to suggest the third etching step as recited in claim 1, where there is formed a pattern of a pitch of $\frac{1}{2}$ the pitch of the resist pattern on the second film to be processed, as correctly recognized in the Office Action.

Lowrey fails to cure this deficiency of Aminpur at least because Lowrey does not suggest that the Aminpur process should be modified such that the pitch of the gate structure 800 should be reduced to $\frac{1}{2}$ that of either the patterned resist 560 or the trimmed resist 570. Lowrey reduces the pitch due to the photoresist mask strips 121 (see Figure 12), by changing

the feature width of these strips from F to $F/2$ and increasing the spacing between the strips to $3F/2$, followed by depositing and etching $F/2$ thick stringer material on the sidewalls of mandrels 31 (see process described in Figures 12-16). Thus, the resulting stringer strips 151 have $\frac{1}{2}$ the pitch (which Lowrey defines as the feature width plus the space width in col. 1, lines 27-37), of the photoresist mask strips 121.

This process of Lowrey, however, would neither work in the Aminpur process, nor would it be desired. In Lowrey the photoresist mask strips 121 are initially separated by a spacing F and also have a feature width of F . The stringer strips 151 also have a spacing that is the same as the feature width (in this case $F/2$). Thus, the Lowrey process is intended for patterning features underlying the stringer strips 151 that have the same feature width and spacing. By contrast, the Aminpur process is for patterning gates 800 with a feature width much smaller than their spacing, and one skilled in the art would not have modified the Aminpur process using the Lowrey process as suggested in the Office Action. Moreover, using the stringer strips of Lowrey to modify the Aminpur process would have ultimately resulted in two adjacent gates in a single active region, and thus would have rendered the Aminpur process unfit for its intended purpose, i.e., to form a single gate in a single active region with a source and drain on either side of the single gate. Thus, one skilled in the art would not have modified the Aminpur process using the Lowrey process to arrive at the invention as claimed in claim 1.

Fan was cited for allegedly disclosing that the pressure is a result effective variable for etching, and does not cure the deficiencies of Aminpur or Lowrey.

For at least the above reasons, claim 1 is patentable over Aminpur, Lowrey and Fan. Claims 2-6 depend from claim 1 and are patentable for at least the same reasons, as well as for further patentable features recited in the claims.

Applicant believes that the present application is now in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested.

The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by a check being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741. If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicant hereby petitions for such extension under 37 C.F.R. §1.136 and authorizes payment of any such extensions fees to Deposit Account No. 19-0741.

Respectfully submitted,

Date September 26, 2003

By Thomas G. Bilodeau

FOLEY & LARDNER
Customer Number: 22428



22428

PATENT TRADEMARK OFFICE

Telephone: (202) 672-5485

Facsimile: (202) 672-5399

William T. Ellis
Attorney for Applicant
Registration No. 26,874

Thomas G. Bilodeau
Attorney for Applicant
Registration No. 43,438